R-888

APOLLO SOYUZ TEST PROJECT G&N ERROR ANALYSIS (CM 111/IMU 25)

by

S. B. Helfant

June 1975

The Charles Stark Draper Laboratory, Inc.
Cambridge, Massachusetts 02139

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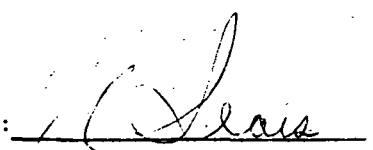
Approved: 
N. Sears

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ACKNOWLEDGMENT

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The author wishes to acknowledge the contributions made to this report by Julius Feldman. Mr. Feldman helped in the review of this and previous reports and many of his suggestions have been included.

This volume is the combined effort of the following additional people: Linda Willy prepared the component performance tabulation and performed the plotting for the inertial components. William Beaton provided the failure rates for the success probability. Their contribution to the preparation of this volume is greatly appreciated.

ABSTRACT

This document presents data on G&N system performance and operation for the CM. For data on the effects of Block II and of measured CM IMU test data deviation uncertainties on earth orbit insertion indication uncertainties and on deorbit burn and reentry uncertainties, the reader is referred to E-2760, the G&N error analysis report for Skylab 2).

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GYRO DRIFT TEST POSITIONS
FOR
SUNDANCE, LUMINARY, COLOSSUS, AND ON

STABLE MEMBER POSITION	STABLE MEMBER ORIENTATION	HORIZONTAL DRIFT	VERTICAL DRIFT
1	X DOWN Y SOUTH Z WEST	NBDY-ADOAY	
2	X DOWN Y WEST Z NORTH	+NBDZ-ADOAZ	-NBDZ+ADIAX
3	X SOUTH Y WEST Z DOWN	NBDX-ADOAX	
4	X EAST Y SOUTH Z DOWN	+NBDY+ADSRAY	+NBDZ+ADIAZ
5*	X WEST Y UP Z NORTH	+NBDZ-ADSRAZ	
6*	X SOUTH Y DOWN Z EAST	+NBDX+ADSRAX	-NBDY+ADIAY
7	X NORTH Y UP-WEST Z UP-EAST	-NBDX+(ADSRAX/$\sqrt{2}$)	
8	X EAST Y UP-NORTH Z UP-SOUTH	(-NBDZ-NBDY)/$\sqrt{2}$ +(ADIAZ-ADIAY)/2 +(ADSRAY+ADSRAZ)/2	
9	X UP-EAST Y UP-WEST Z SOUTH	-NBDZ+(ADSRAZ/$\sqrt{2}$)	
10	X UP-NORTH Y UP-SOUTH Z EAST	(NBDY-NBDX)/$\sqrt{2}$ +(ADIAY-ADIAX)/2 +ADSRAX/2	
11	X NORTH Y WEST Z UP	-NBDX-ADOAX	
12	X UP Y SOUTH Z EAST	+NBDY+ADOAY	
13	X UP Y EAST Z NORTH	+NBDZ+ADOAZ	

*Positions 5 and 6 are lab test only.

G&N MISSION RELIABILITY ANALYSIS

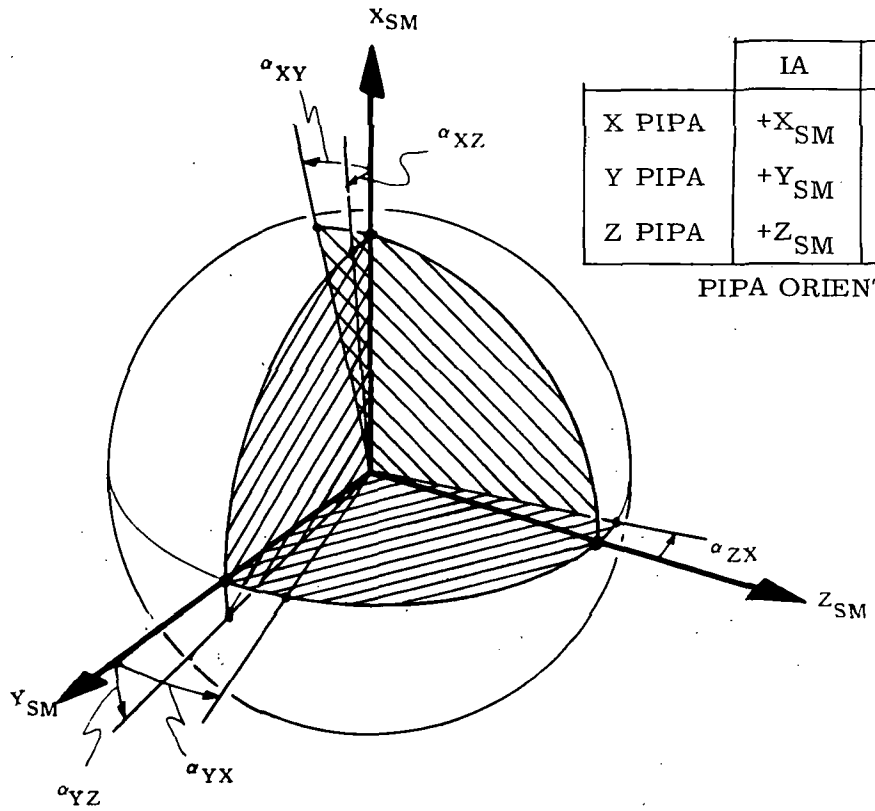
Failure rates used were obtained, for the most part, from observed Apollo field and flight experience of the PGNS. Each reported failure was analyzed with respect to its likelihood of occurrence in flight and the impact on the Mission should such failure occur. The result was to count only those reported failures which could occur in flight and which would degrade the Mission, should they occur.

SUBSYSTEM	MODE (time/cycles)	FAILURE RATE ($\lambda \times 10^6$)	MISSION DURATION (hrs or cycles)	$e^{-\lambda t}$
AGC	Operate	19.2	218	0.99582
	Calendar	2.8	218	0.99939
	Envirn	30.9	0.2	0.99999
	On/Off	238.1	0	1.00000
DSKY*	Operate	1.4	218	0.99999
	Calendar	0.9	218	0.99999
	Envirn.	122.9	0.2	0.99999
	On/Off	1190.5	0	1.00000
IMU CDU**	Operate	20.2	218	0.99561
	Calendar	2.4	218	0.99948
	Envirn	62.5	0.2	0.99999
	On/Off	1666.6	0	1.00000
IMU	Operate	94.1	218	0.97969
	Calendar	2.6	218	0.99943
	Envirn	18.5	0.2	0.99999
	On/Off	142.9	0	1.00000
IMU Electronics (PSA)	Operate	8.4	218	0.99817
	Calendar	1.2	218	0.99974
	Envirn	18.5	0.2	0.99999
	On/Off	714.3	0	1.00000
Optics Assembly	Operate	119.3	218	0.97433
	Calendar	1.8	218	0.99961
	Envirn	18.5	0.2	0.99999
	On/Off	238.1	0	1.00000
Optics Electronics	Operate	17.2	218	0.99626
	Calendar	7.1	218	0.99845
	Envirn	18.5	0.2	0.99999
	On/Off	142.9	0	1.00000

G&N MISSION RELIABILITY
CM = 0.93736

*Considers parallel redundancy $(1-(1-e^{-\lambda t})^2)$

**Includes CM Optics CDU



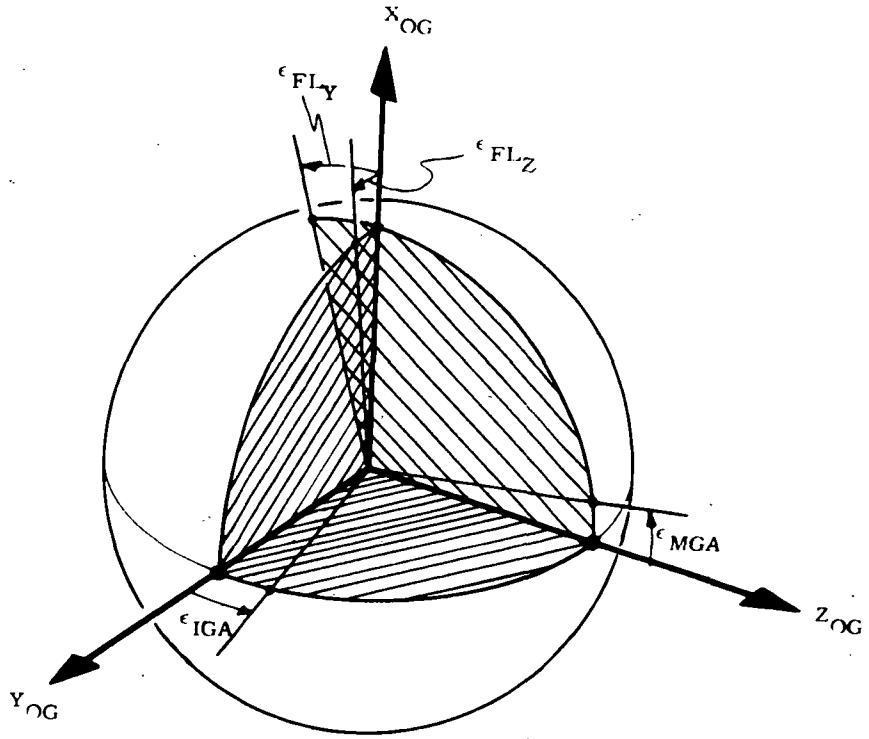
	IA	OA	PRA
X PIPA	$+X_{SM}$	$+Z_{SM}$	$-Y_{SM}$
Y PIPA	$+Y_{SM}$	$-Z_{SM}$	$+X_{SM}$
Z PIPA	$+Z_{SM}$	$+X_{SM}$	$-Y_{SM}$

PIPA ORIENTATIONS

PIPA Misalignments from Ideal Stable Member Axes

Term	(Angle in $\widehat{\text{Sec}}$) CM-IMU 25
α_{XY}	+ 24
α_{XZ}	+ 7
α_{YZ}	+ 6
α_{YX}	- 14
α_{ZX}	+ 3

DEFINITION OF POSITIVE SENSE
PIPA INPUT-AXIS MISALIGNMENTS
with respect to
IDEAL STABLE MEMBER AXES



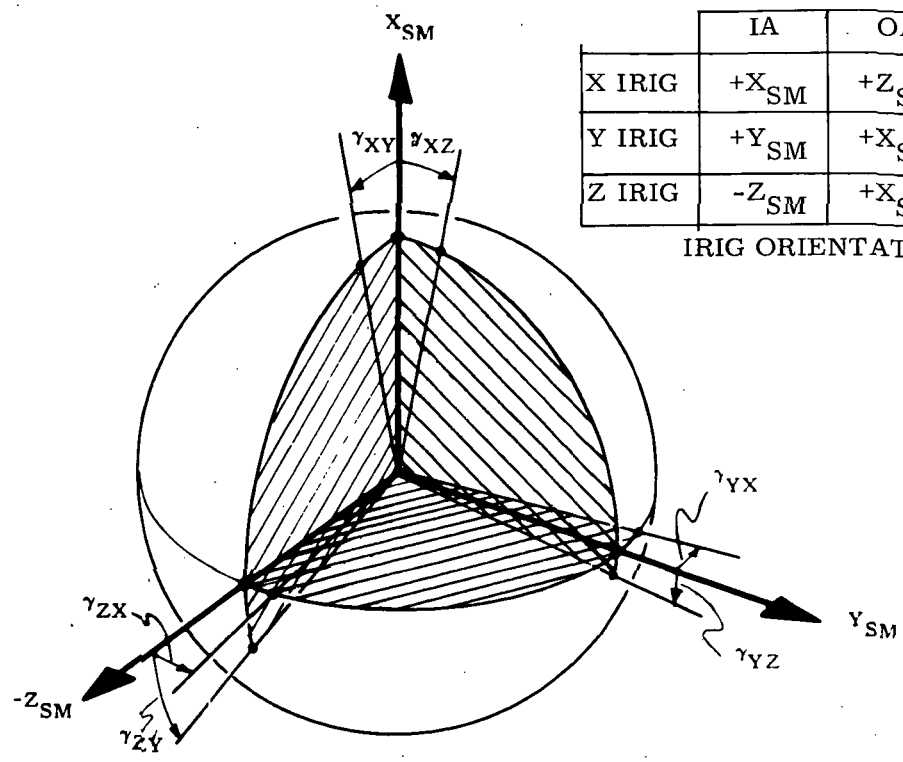
Gimbal Axis Orthogonality Errors and Outer Gimbal Misalignment from Casemounting Axes

Term	(Angle in Sec) CM-IMU 25
ϵ_{IGA}	+ 6
ϵ_{MGA}	- 20
ϵ_{FLY}	- 1
ϵ_{FLZ}	- 9

DEFINITION OF POSITIVE SENSE
GIMBAL AXIS ORTHOGONALITY
and
OUTER GIMBAL ALIGNMENT
with respect to
CASE MOUNTING ALIGNMENT

	IA	OA	SRA
X IRIG	$+X_{SM}$	$+Z_{SM}$	$-Y_{SM}$
Y IRIG	$+Y_{SM}$	$+X_{SM}$	$-Z_{SM}$
Z IRIG	$-Z_{SM}$	$+X_{SM}$	$-Y_{SM}$

IRIG ORIENTATION



IRIG Misalignments from Ideal Stable Member Axes

Term	(Angle in Sec) CM-IMU 25
γ_{XY}	- 46
γ_{XZ}	+ 2
γ_{YZ}	+ 50
γ_{YX}	+ 106
γ_{ZX}	- 145
γ_{ZY}	+ 16

Block II G&N
DEFINITION OF POSITIVE SENSE
IRIG INPUT-AXIS MISALIGNMENTS
with respect to
IDEAL STABLE MEMBER AXES

IMU S/N 25
CM 111/G&N 215

IRIGs	PIPAs
X = 8A128	X = 2AP110R
Y = 8A121	Y = 2AP276
Z = 8A120	Z = 2AP282

NASA 8A-128

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	WHEEL HOURS	I+	I-	ID	ADDA
5AU69	A41	CSS								C102					
5AU69	A41	CSS			(- 15.9)	(0.4)	(0.0)			C 99				- 8.5	
6AU69	SG 83.7, 67.6, 49.9 TG 54.7, 68.8, 49.9														
12AU69	A43	CSS			(- 16.9)	(0.6)	(2.3)			144				- 7.9	
14AU69	A43	CSS								142					
15AU69	A43	CSS			(- 15.7)	(- 2.3)	(0.2)			144				- 9.5	
21AU69	COMP SELECT														
21AU69	A43	CSS						96 -	175	143		85.011	85.009		
22AU69	COMP VERIF														
22AU69	A43	CSS						151 -	161			85.010	85.008		
22AU69	DEMO T/F = 1210.08														
22AU69	A43	CSS						165 -	175	140		85.011	85.008		
25AU69	VIB IA ALIGN = +0.65														
26AU69	A43	CA1			- 1.2	1.5	5.5								
26AU69	A43	CA2			- 0.7	0.9	3.8	172 -	250			85.009	85.007	- 7.8	
26AU69	A43	CA3			- 1.2	1.2	3.1			143					
27AU69	A43	CB1			- 0.5	1.1	3.6								
27AU69	A43	CB2			- 0.2	1.4	0.8	124 -	130			85.001	85.007	- 8.1	
27AU69	A43	CB3			- 0.6	1.0	0.6			142					
29AU69	A43	CC1			- 1.2	1.6	1.4								
29AU69	A43	CC2			- 0.7	1.1	- 2.0	200 -	257						
29AU69	A43	CC3			- 0.7	1.1	- 1.1			141	405	85.010	85.008	- 9.4	
2SE69	M/O TO 0814														
2SE69	UNIT INSTALLED IN IMU S/N 20-REPLACING 8A-127														
10C69	A01	SPR	Y	20	0.9		- 0.9								
10OC69	A01	SPR	Y	20	- 0.2	- 1.5									1.2,
10OC69	A01	SPR	Y	20				- 27 -	184		516				
23DE69	A03	SPO	Y	20	0.2		5.2								
23DE69	A03	SPO	Y	20	- 0.1	0.8									0.5
30DE69	A03	SPO	Y	20				- 417 -	561		763	85.006			
6JA70	GRAVITY TRANSIENT TEST, NO FLUID TRANSIENTS DETECTED.														
22JA70											819				
21AP70	A04	SPO	Y	20	- 0.9		1.4								
21AP70	A04	SPO	Y	20	- 2.0	1.2				C111					1.3
22AP70	A04	SPO	Y	20				- 227 -	274			85.009			
5MY70											891				
22JL70	A03	SPO	Y	20	0.1		2.7								
22JL70	A03	SPO	Y	20	- 0.7	3.0									1.3
29JL70	A03	SPO	Y	20				- 107 -	150		926	85.018			
7AU70	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.														
17AU70	A03	SPO	Y	20							1000				
11JA71	A03	SPO	Y	20	1.0		12.3								
11JA71	A03	SPO	Y	20	0.6	1.7				C115					1.3
12JA71	A03	SPO	Y	20				- 50 -	7			85.019			
14AP71	A01	SPO	Y	20	1.1		2.0								
15AP71	A01	SPO	Y	20	0.4	0.9		- 150 -	361			85.005			0.8
21AP71	IMU S/N 20 SHIPPED FROM DELCO/MKE TO NR.														
26AP71	IMU 20 G&N 218 INSTALLED IN CM-114.														
29AP71	NSC	G&N	Y	20 218	4.9	- 0.1	- 0.8	- 175 -	376						
23JE71	NSC	G&N	Y	20 218	5.9	2.0	7.1	- 524 -	525						

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DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHRRL RDT	HOURS	I+	I-	ID	ADOA
23JE71	ADIAY POSITION 8						3.9								
16JL71	NSC	G&N	Y	20	2.9	2.9	7.7	- 432	- 549						
30AU71	IMU 20 SHIPPED FROM NR TO DELCO/MKE.														
2NO71	A03	SPO	Y	20	2.3		11.2								
2NO71	A03	SPO	Y	20	2.1	2.6									1.0
3NO71	A03	SPO	Y	20				- 240	- 373			84.993			
29FE72											1545				
8MR72	A03	SPO	Y	20	3.2		5.5								
9MR72	A03	SPO	Y	20	4.5	5.1		- 40	7			85.008			
30MR72	NO FLUID TRANSIENT OBSERVED DURING GRAVITY TRANSIENT TEST.														
9MY72	IMU-20 SHIPPED FROM DELCO/MKE TO KSC														
18MY72	IMU-20 INSTALLED IN CM-114 AT KSC.														
31MY72	K0B	G&N	Y	20 218	1.4	5.8	3.4								1.0
31MY72	ADIAY POSITION 8						7.9								
22JE72	K0B	G&N	Y	20 218	1.6	4.6	8.0	- 306	- 349						0.5
22JE72	ADIAY POSITION 8						3.1								
11SE72	K9A	G&N	Y	20 218	0.1	5.9	10.0	- 257	- 473		1894				1.1
11SE72	ADIAY POSITION 8						9.5								
17OC72	K9A	G&N	Y	20 218	- 0.2	5.1	15.1								1.2
17OC72	AD1AY POSITION 8						11.3								
18NO72	K9A	G&N	Y	20 218	1.4	4.5	11.0								0.9
18NO72	ADIAY POSITION 8						8.7								
28NO72	PRE-LAUNCH COMPENSATION: NBD= -0.1 ADIA= 13.0 ADSRA= 6.0														
5DE72	K9A	G&N	Y	20 218	0.6	4.7	10.3								1.1
5DE72	ADIAY POSITION 8						15.5								
6DE72	IMU-20 G&N-218 CM-114 LAUNCHED APOLLO 17.														
7DE72											1991				
7DE72	NBD COMPENSATION UPDATE= 0.3 MRAD AT 23 HRS 45 MIN. GET														
19DE72	IMU-20 G&N-218 CM-114 RECOVERED. APOLLO 17.														
12MR73	IMU-20 SHIPPED FROM NR TO DELCO/SB.														
21MR73	SB6	SPO	Y	20				- 32	- 151			85.001			
26MR73	SB6	SPO	Y	20	1.5		9.4			C113					
26MR73	SB6	SPO	Y	20	1.2	4.5				C113					
9AP73	UNIT REMOVED FROM IMU-20, ASSIGNED TO IMU-25 X-POS REPL. 9040														
30AP73											2068				
4MY73	SB5	SPO	X	25	0.6		17.3			C113					
4MY73	SB5	SPO	X	25	0.9	5.3		- 350	- 394			85.003			
9MY73	SB5	SPO	X	25	3.3		8.4								
9MY73	SB5	SPO	X	25	1.9	6.2									
11MY73	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.														
30MY73											2178				
24AU73	SB6	SPO	X	25				93	197			85.003			1.2
27AU73	SB6	SPO	X	25	0.7		13.8			C113					
27AU73	SB6	SPO	X	25	0.9	4.6									
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE														
24SE73	IMU-25 INSTALLED IN CM-119,G&N-213,SL-RESCUE VEHICLE														
07DE73	K9B	G&N	X	25 213	1.6	1.1	17.8	295	365						1.5
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO														
19JE74	SB6	SPO	X	25	1.6		17.4	95	210	C 91		85.004			1.2
19JE74	SB6	SPO	X	25	1.5	7.1									

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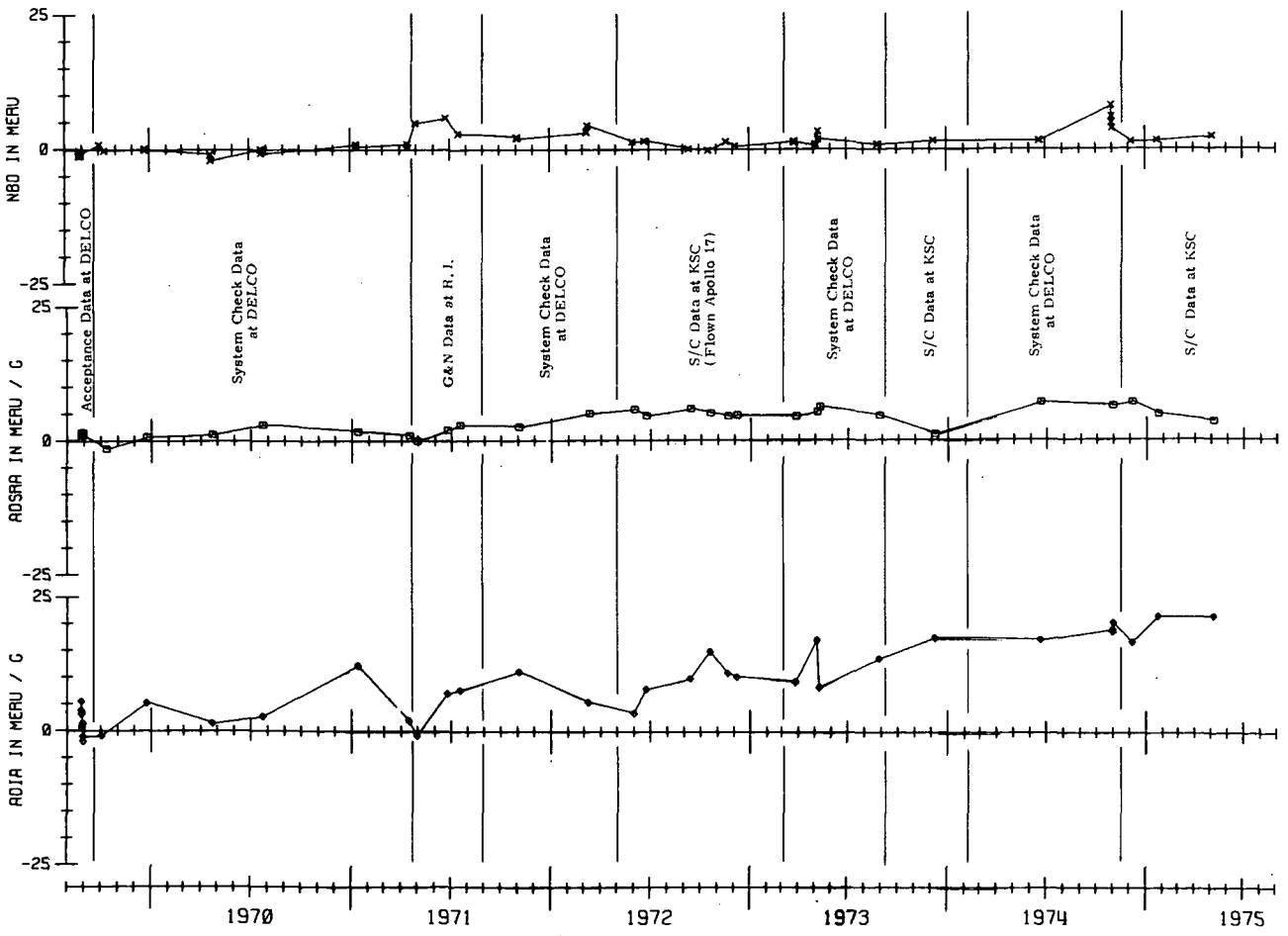
DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	HOURS	I+	I-	TD	ADIA
30OC74	SB6	SPO	X	25	8.1		19.4	- 354	- 124			85.002			1.7
30OC74	SB6	SPO	X	25	6.0		18.9								
30OC74	SB6	SPO	X	25	4.8	6.4									
31OC74	SB6	SPO	X	25	3.8		20.7			C113					
18NO74	IMU	25 SHIPPED FROM DRLCO TO KSC													
26NO74	IMU	25 INSTALLED IN CM-111													
5DE74	KOB	G&N	X	25	215	1.3	7.1	17.0	- 341	- 457					1.5
22JA75	KOB	G&N	X	25	215	1.5	4.8	21.9	- 257	- 352					1.7
5MY75	K9A	G&N	X	25	215	2.3	3.4	21.9	- 348	232					1.6
7MY75											2617				

8A-128 COMPLETED

G&N 215, CM 111, IMU 25, APOLLO IRIG 8A128, X AXIS



DRIFT PLOTTED BY TIME

NASA 8A-121

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	HOURS	I+	I-	ID	ADDA
12JE69	A44	CSS								C104					
12JE69	A44	CSS			(- 2.1)	(- 0.4)	(- 5.5)			C106				- 5.8	
12JE69	SG 76.3, 61.6, 45.9 TG 50.1, 63.1, 74.5														
16JE69	A44	CSS			(- 1.6)	(- 1.7)	(- 0.7)			150				- 5.8	
19JE69	A44	CSS			(- 1.9)	(- 1.7)	(- 3.2)			149				- 5.8	
20JE69	A44	CSS								144					
24JE69	COMP SELECT														
24JE69	A44	CSS						82	13	154		85.009	85.009		
25JE69	COMP VERIF														
25JE69	A44	CSS						86	- 24			85.013	85.015		
26JE69	DEMO T/F = 1199.8 / LOW RDT 2 EXTRA RDT'S TAKEN														
26JE69	A44	CSS						- 70	- 79	132		85.014	85.016		
26JE69	A44	CSS								143					
26JE69	A44	CSS								145					
27JE69	VIB IA ALIGN = -0.4,														
27JE69	A44	CA1			- 1.9	- 4.2	- 16.0								
27JE69	A44	CA2			- 1.5	- 4.2	- 16.2	514	451			85.017	85.019	- 6.1	
27JE69	A44	CA3			- 1.4	- 4.3	- 17.0			149					
30JE69	A44	CB1			- 1.8	- 4.2	- 14.2								
30JE69	A44	CB2			- 1.4	- 4.7	- 15.7	635	519			85.025	85.022	- 5.5	
30JE69	A44	CB3			- 1.8	- 4.2	- 15.5			148					
2JL69	A44	CC1			- 1.6	- 4.7	- 7.4								
2JL69	A44	CC2			- 2.0	- 4.3	- 9.0	372	550			85.012	85.014	- 6.8	
2JL69	A44	CC3			- 1.4	- 4.6	- 11.8			153	430				
16JL69	RDT RMS DEV = 5.9 DDS / ACCEPTED ON WAIVER C1263 M/3 TO 0814														
28AU69	UNIT INSTALLED IN IMU S/N 20, REPLACING 7A-134														
10C69	A01	SPR X 20			- 3.3	- 4.8									1.7
10C69	A01	SPR X 20			- 3.8		- 8.0								
100C69	A01	SPR X 20						27	427		537				
23DE69	A03	SPO X 20			- 4.4		- 3.7								
23DE69	A03	SPO X 20			- 2.9	- 6.7									1.9
30DE69	A03	SPO X 20						- 441	7		787	85.006			
6JA70	GRAVITY TRANSIENT TEST, NO FLUID TRANSIENTS DETECTED.														
22JA70											843				
21AP70	A04	SPO X 20			- 3.0		6.0								
21AP70	A04	SPO X 20			- 2.6	- 6.7				C106					1.5
22AP70	A04	SPO X 20						- 294	50			85.009			
5MY70											915				
21JL70	A03	SPO X 20			- 4.6		4.7								
22JL70	A03	SPO X 20			- 1.7	- 8.3									2.3
29JL70	A03	SPO X 20						27	451		950	85.019			
7AU70	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.														
17AU70	A03	SPO X 20									1024				
11JA71	A03	SPO X 20			- 2.0		7.7								
11JA71	A03	SPO X 20			- 1.8	- 6.8				C113					2.2
12JA71	A03	SPO X 20						50	461			85.019			
14AP71	A01	SPO X 20			- 2.6		7.2								
14AP71	A01	SPO X 20			- 0.8	- 7.0									1.3
15AP71	A01	SPO X 20						- 174	240			85.003			
21AP71	IMU S/N 20 SHIPPED FROM DELCO/MKE TO NR.														

8A-121 CONTINUED

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	HOURS	I+	I-	ID	ADOA
26AP71	IMU 20 G&N 218 INSTALLED IN CM-114.														
29AP71	NSC	G&N	X	20 218	0.7	- 8.5	6.0	- 287	- 213						
23JE71	NSC	G&N	X	20 218	- 1.2	- 5.9	12.5	- 384	- 340						
16JL71	NSC	G&N	X	20	0.9	- 6.4	13.5	- 432	- 381						
30AU71	IMU 20 SHIPPED FROM NR TO DELCO/MKF.														
1NO71	A03	SPO	X	20	- 1.3		11.9								
1NO71	A03	SPO	X	20	- 1.9	- 2.6									8.7
3NO71	A03	SPO	X	20				- 207	227			84.999			
29FE72											1569				
7MR72	A03	SPO	X	20	0.1		10.3								
7MR72	A03	SPO	X	20	- 1.0	- 1.2		17	361			85.016			
30MR72	NO FLUID TRANSIENT OBSERVED DURING GRAVITY TRANSIENT TEST.														
9MY72	IMU-20 SHIPPED FROM DELCO/MKF TO KSC														
18MY72	IMU-20 INSTALLED IN CM-114 AT KSC.														
31MY72	K0B	G&N	X	20 218	- 1.5	- 6.1	7.4								3.1
22JE72	K0B	G&N	X	20 218	- 1.1	- 5.7	4.8	- 150	- 75						3.2
11SE72	K9A	G&N	X	20 218	0.4	- 6.2	11.0	- 213	114		1918				3.1
17OC72	K9A	G&N	X	20 218	0.8	- 6.4	3.5								2.9
18NO72	K9A	G&N	X	20 218	1.4	- 6.2	3.5								2.6
28NO72	PRE-LAUNCH COMPENSATION: NBD= 0.6 ADIA= 7.0 ADSRA= -6.9														
5DE72	K9A	G&N	X	20 218	1.9	- 6.7	4.1								2.7
6DE72	IMU-20 G&N-218 CM-114 LAUNCHED APOLLO 17.														
7DE72											2015				
7DE72	NBD COMPENSATION UPDATE= 2.0 MERU AT 23 HRS 45 MIN. GET														
19DE72	IMU-20 G&N-218 CM-114 RECOVERED. APOLLO 17.														
12MR73	IMU-20 SHIPPED FROM NR TO DELCO/SB.														
21MR73	SB6	SPO	X	20				- 91	488			85.001			
26MR73	SB6	SPO	X	20	0.7		- 3.4			C111					
26MR73	SB6	SPO	X	20	0.7	- 4.9				C113					
9AP73	UNIT REMOVED FROM IMU-20, ASSIGNED TO IMU-25 Y-POS REPL. 9014														
30AP73											2092				
4MY73	SB5	SPO	Y	25	2.2		- 3.6			C113					
4MY73	SB5	SPO	Y	25	2.3	- 6.2		- 360	7			85.002			
9MY73	SB5	SPO	Y	25	1.6		- 2.8								
9MY73	SB5	SPO	Y	25	2.3	- 6.0									
11MY73	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.														
30MY73											2202				
24AU73	SB6	SPO	Y	25				65	395			85.004			2.0
27AU73	SB6	SPO	Y	25	2.7		- 2.1			C115					
27AU73	SB6	SPO	Y	25	2.9	- 8.9									
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE														
24SE73	IMU-25 INSTALLED IN CM-119,G&N-213,SL-RESCUE VEHICLE														
07DE73	K9B	G&N	Y	25 213	0.2	- 5.7	1.8	119	503						2.7
07DE73	POSITION 8 ADIA 0.3														
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO														
20JE74	SB6	SPO	Y	25	3.2		- 7.1	- 28	313	C120		85.004			1.4
20JE74	SB6	SPO	Y	25	3.4	- 6.2									
31OC74	SB6	SPO	Y	25	2.6		- 6.0	- 135	145			85.002			2.9
31OC74	SB6	SPO	Y	25	2.8	- 6.1				C115					
18NO74	IMU 25 SHIPPED FROM DELCO TO KSC														

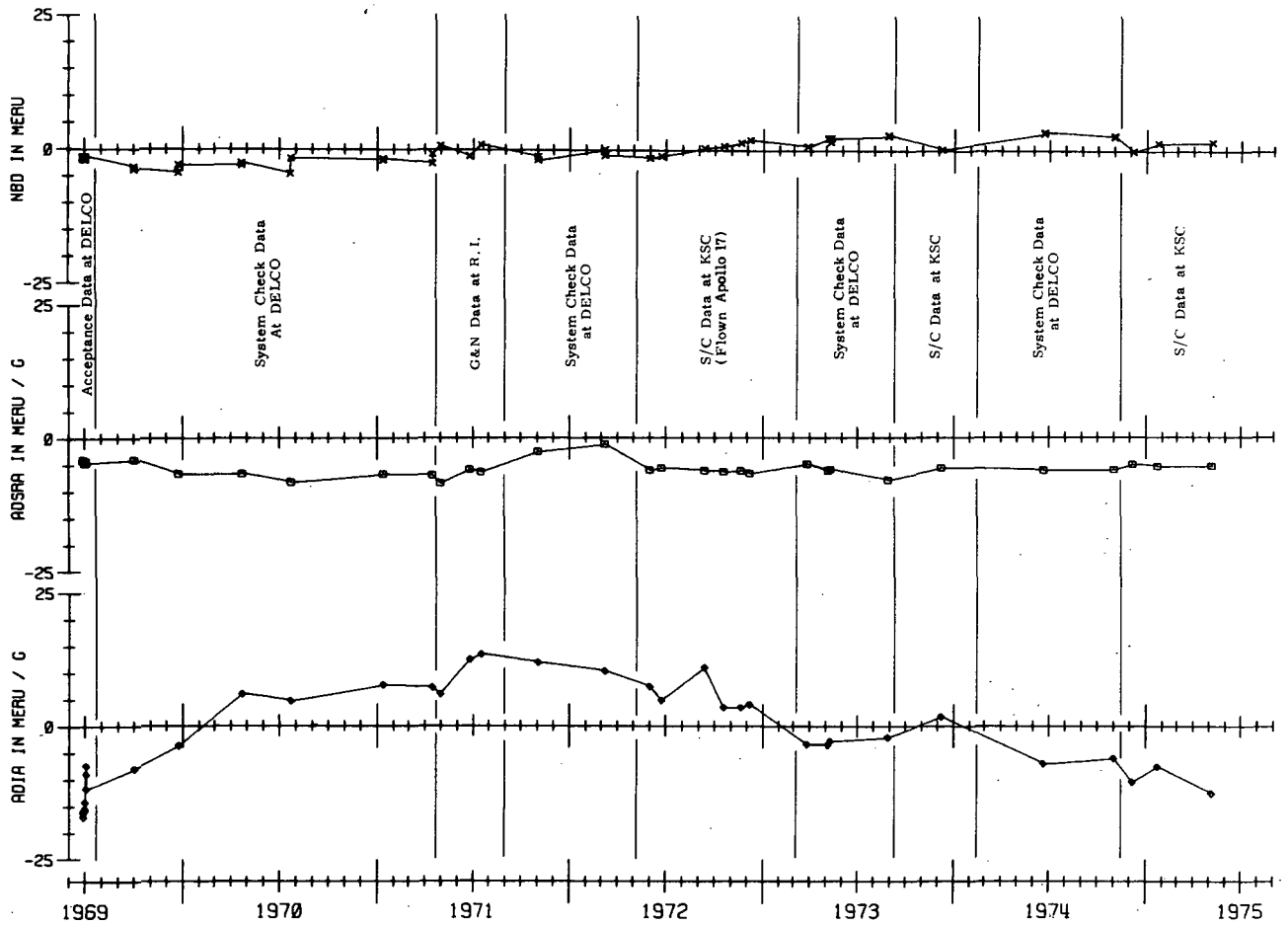
8A-121 CONTINUED

NASA 8A-121

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT HOURS	I+	I-	TD	ADDA
26NO74	IMU 25 INSTALLED IN CM-111													
5DE74	KOB	G&N Y	25	215	- 0.1	- 5.1	- 10.5	- 370	- 34					1.6
5DE74	POSITION 8 ADIA				- 6.5									
														2.4
22JA75	KOB	G&N Y	25	215	1.4	- 5.5	- 7.6	- 329	20					2.4
22JA75	POSITION 8 ADIA				- 6.3									
5MY75	K9A	G&N Y	25	215	1.6	- 5.4	- 12.6	- 471	- 118					2.3
5MY75	POSITION 8 ADIA				- 9.3									
7MY75										2641				

8A-121 COMPLETED

G&N 215, CM 111,IMU 25, APOLLO IRIG 8A121, Y AXIS



DRIFT PLOTTED BY TIME

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	HOURS	I+	I-	ID	ADOA
11JE69	A43	CSS								C110					
11JE69	A43	CSS			(- 3.5)	(- 1.3)	(- 5.3)			C118				-10.3	
12JE69	SG 83.3, 69.1, 52.1			TG 54.9, 68.2, 87.5					PRF H5235						
13JE69	A41	CSS			(- 3.5)	(- 3.3)	(- 7.8)			152				- 9.9	
17JE69	A44	CSS								153					
17JE69	A44	CSS			(- 4.1)	(- 3.0)	(- 7.2)			146				-11.2	
19JE69	COMP SELECT														
19JE69	A43	CSS						155	109	136		85.011	85.008		
20JE69	COMP VERIF														
20JE69	A43	CSS						37	- 33	155		85.011	85.009		
23JE69	DEMO T/F = 1221.8														
23JE69	A43	CSS						65	- 59	153		85.007	85.004		
23JE69	VIB. VISUAL REJ./ WIRES REPAIRED & UNIT RE-ALIGNED 2 TIMES														
24JE69	RE-VIB IA ALIGN = +1.15														
25JE69	A43	CA1			- 0.7	- 0.3	- 9.3								
25JE69	A43	CA2			- 1.1	- 0.1	- 8.5	- 32	- 18			85.010	85.007	- 9.5	
25JE69	A43	CA3			- 0.7	0.2	- 8.3			144					
27JE69	A43	CB1			- 0.8	- 0.3	- 9.4								
27JE69	A43	CB2			- 0.8	- 0.5	- 9.9	234	88			85.011	85.007	-10.6	
27JE69	A43	CB3			- 0.8	- 0.7	- 10.5			152					
29JE69	A43	CC1			- 0.4	- 1.0	- 11.9								
29JE69	A43	CC2			- 0.8	- 0.5	- 11.3	- 18	- 45			85.011	85.009	- 8.6	
29JE69	A43	CC3			- 0.8	- 0.6	- 8.6			153	424				
30JE69	CHANGE IN TORQUE LEVEL DURING AXIAL TRAVEL NOT A FAILURE														
7JL69	ACCEPTED ON WAAIVER C1261 (RMS DEV. OF RDT = 6.0) M/O TO 0814														
	UNIT INSTALLED IN IMU S/N 48Z,REPLACING 7C-125														
8AU69	A03	SPO	Z 48		0.2	- 0.2		17	- 340			85.009			2.1
8AU69	A03	SPO	Z 48		0.4		- 9.5								
8AU69	A03	SPO	Z 48							C113					
8AU69	A03	SPO	Z 48							C117					
8AU69	A03	SPO	Z 48							C115	483				
	UNIT REMOVED FROM IMU S/N 48,REPLACED BY 8A-125														
21AU69	UNIT REALIGNED														
28AU69	UNIT INSTALLED IN IMU S/N 20,REPLACING 7A-191														
10OC69	A01	SPR	Z 20		- 1.9		- 12.2								
10OC69	A01	SPR	Z 20		- 1.7	- 0.3		107	- 307		589				2.0
23DE69	A03	SPO	Z 20		- 2.5		- 8.8								
23DE69	A03	SPO	Z 20		- 1.8	- 1.5									2.0
30DE69	A03	SPO	Z 20				-	150	- 528		939	85.008			
6JA70	GRAVITY TRANSIENT TEST, NO FLUID TRANSIENTS DETECTED.														
22JA70											896				
21AP70	A04	SPO	Z 20		- 1.8		- 7.7								
21AP70	A04	SPO	Z 20		- 1.6	1.7				C115					2.4
22AP70	A04	SPO	Z 20					83	- 317			85.010			
5MY70											967				
22JL70	A03	SPO	Z 20		- 1.8		- 7.2								
22JL70	A03	SPO	Z 20		- 1.9	0.2									2.2
29JL70	A03	SPO	Z 20					260	- 127		1002	85.019			
7AU70	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.														

8A-120 CONTINUED

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	HOURS	I+	I-	TD	ADDA
17AU70	A03	SPO	Z	20							1076				
11JA71	A03	SPO	Z	20	- 2.6		- 8.7								
11JA71	A03	SPO	Z	20	- 1.9	- 1.0				C121					1.3
12JA71	A03	SPO	Z	20				327	- 73			85.018			
15AP71	A01	SPO	Z	20	- 0.4		- 9.4								
15AP71	A01	SPO	Z	20	0.1	0.5		127	- 284			85.005			1.7
21AP71	IMU S/N 20 SHIPPED FROM DELCO/MKE TO NR.														
26AP71	IMU 20 G&N 218 INSTALLED IN CM-114.														
29AP71	NSC	G&N	Z	20	218 - 1.4	- 5.9	- 7.1	- 142	- 457						
23JE71	NSC	G&N	Z	20	218 0.3	- 6.9	- 6.4	- 285	- 518						
16JL71	NSC	G&N	Z	20	- 0.4	- 6.0	- 6.5	- 122	- 646						
30AU71	IMU 20 SHIPPED FROM NR TO DELCO/MKE.														
2NO71	A03	SPO	Z	20	1.2		- 9.7								
2NO71	A03	SPO	Z	20	1.8	0.0									2.5
3NO71	A03	SPO	Z	20				94	- 274			85.003			
29FE72											1621				
21MR72	A03	SPO	Z	20	3.7		- 10.6								
21MR72	A03	SPO	Z	20	3.2	- 0.2		417	- 73			85.009			
30MR72	NO FLUID TRANSIENT OBSERVED DURING GRAVITY TRANSIENT TEST.														
9MY72	IMU-20 SHIPPED FROM DELCO/MKE TO KSC.														
18MY72	IMU-20 INSTALLED IN CM-114 AT KSC.														
31MY72	K0B	G&N	Z	20	218 2.1	- 3.4	- 10.4								2.9
22JE72	K0B	G&N	Z	20	218 0.9	- 2.9	- 12.5	- 114	- 280						2.9
11SE72	K9A	G&N	Z	20	218 1.7	- 3.4	- 5.9	204	- 331		1971				2.7
17OC72	K9A	G&N	Z	20	218 0.7	- 4.4	- 7.0								2.4
18NO72	K9A	G&N	Z	20	218 0.5	- 3.8	- 7.1								2.5
28NO72	PRE-LAUNCH COMPENSATION: NBD= 1.2 ADIA= -6.0 ADSRA= -4.0														
5DE72	K9A	G&N	Z	20	218 2.3	- 3.1	1.2								2.0
6DE72	IMU-20 G&N-218 CM-114 LAUNCHED APOLLO 17.														
7DE72											2067				
7DE72	NBD COMPENSATION UPDATE= 2.7 MERU AT 23 HRS 45 MIN. GET														
19DE72	IMU-20 G&N-218 CM-114 RECOVERED. APOLLO 17.														
12MR73	IMU-20 SHIPPED FROM NR TO DELCO/SB.														
22MR73	SB6	SPO	Z	20				439	- 124			85.000			
27MR73	SB6	SPO	Z	20	0.7		- 4.3			C109					
27MR73	SB6	SPO	Z	20	1.8	0.1				C114					
9AP73	UNIT REMOVED FROM IMU-20, ASSIGNED TO IMU-25 Z-POS REPL. 9022														
30AP73											2145				
5MY73	SB5	SPO	Z	25	2.7		- 8.0			C118					
5MY73	SB5	SPO	Z	25	3.0	1.4		40	- 451			85.003			
10MY73	SB5	SPO	Z	25	3.9		- 6.2								
10MY73	SB5	SPO	Z	25	3.5	1.2									
11MY73	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.														
30MY73											2255				
24AU73	SB6	SPO	Z	25				432	- 76			85.003			1.6
27AU73	SB6	SPO	Z	25	0.9		- 6.1			C120					
27AU73	SB6	SPO	Z	25	1.7	- 0.1									
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE														
24SE73	IMU-25 INSTALLED IN CM-119, G&N-213, SL-RESCUE VEHICLE														

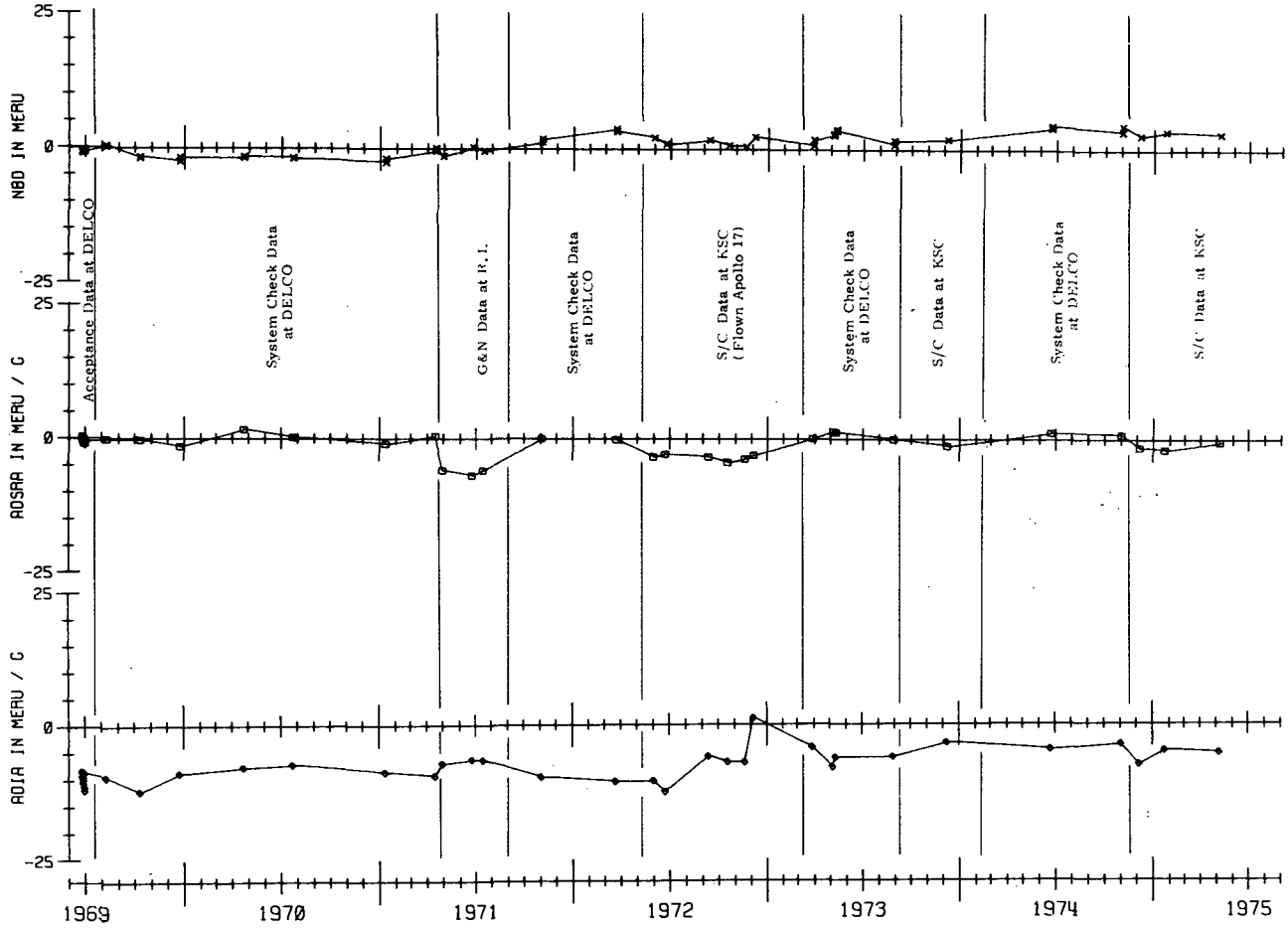
8A-120 CONTINUED

NASA 8A-120

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSRA	ADIA	DELSF+	DELSF-	WHEEL RDT	WHEEL HOURS	I+	I-	ID	ADDA
07DE73	K9B	G&N	Z 25	213	1.9	- 1.3	- 3.4	601	- 179						2.8
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO														
21JE74	SB6	SPO	Z 25		4.1		- 4.7	355	- 95	C116		85.003			2.1
21JE74	SB6	SPO	Z 25		4.5	1.2									
1NO74	SB6	SPO	Z 25		3.4		- 3.7	235	- 276			85.001			2.1
1NO74	SB6	SPO	Z 25		4.5	0.8				C124					
18NO74	IMU 25 SHIPPED FROM DELCO TO KSC														
26NO74	IMU 25 INSTALLED IN CM-111														
5DE74	K0B	G&N	Z 25	215	2.7	- 1.6	- 7.6	8	- 438						2.2
22JA75	K0B	G&N	Z 25	215	3.5	- 2.0	- 4.9	7	- 480						2.7
5MY75	K9A	G&N	Z 25	215	3.0	- 0.6	- 5.4	19	- 27						2.5
7MY75											2693				

8A-120 COMPLETED

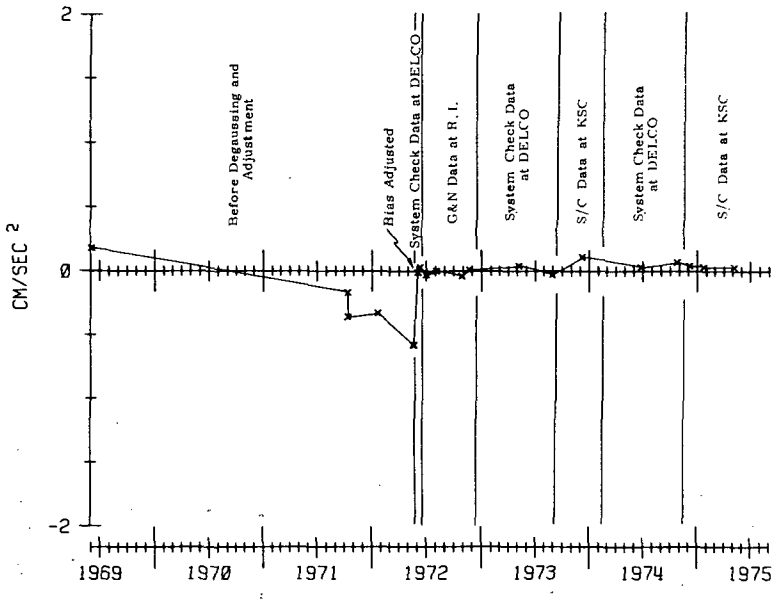
G&N 215, CM 111, IMU 25, APOLLO IRIG 8A120, Z AXIS



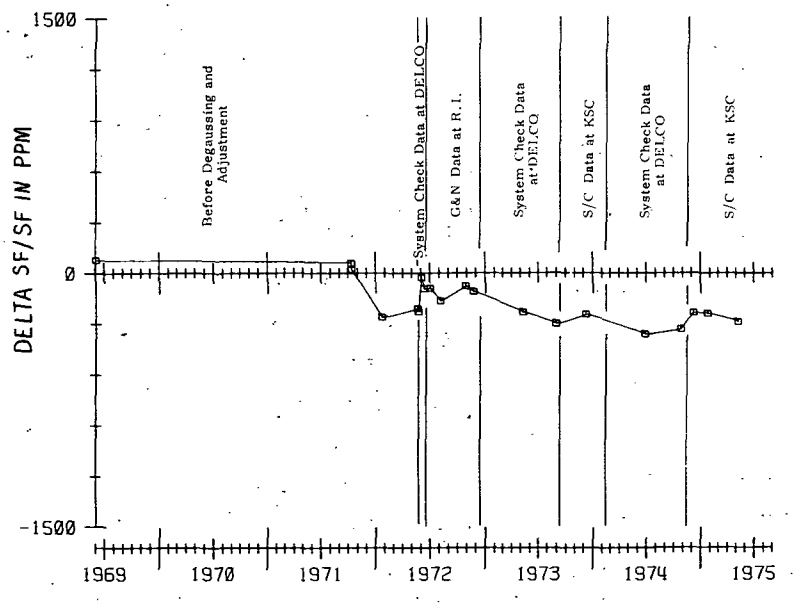
DRIFT PLOTTED BY TIME

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SP	IG BIAS	NULL BIAS	ROT-AL-WOB ANGLE		TRANS.	TORQ MON CURRENT
	UNIT INTERNALLY REPAIRED, REBUILT TO P/N 2001730-2										
15JA69	S42	ACC			103	0.00				0.02	104.0500
	REPAIRED UNIT DELIVERED TO AC-MKE										
3JE69	A44	FST			78	0.18		- 8	- 5		
11OC71	A48	CRT			58	-0.17	-0.15			0.05	104.1000
11OC71	A48	CRT					(-0.12)	- 14	15		
12OC71	A48	CRT			20	-0.36	-0.31				104.0985
20JA72	A48	CRT			- 263	-0.33	-0.31			0.02	104.0964
20JA72	A48	CRT					(-0.31)	- 22	- 9		
19MY72	A48	CRT			- 210	-0.58	-0.56			0.03	104.1004
21MY72	A48	CRT			- 229	-0.58	-0.55				104.1003
21MY72	A48	CRT					(-0.58)	- 21	1		
25MY72	UNIT ASSIGNED TO IMU-25. X POS. REPLACES 2AP-271.										
2JE72	A03	SPO	X	25	(- 143)	(-0.64)	(-0.67)				104.0907
2JE72	RAN EO 3700-NULL RESOLUTION										
2JE72	A03	SPO	X	25	- 27	-0.01	0.02			0.05	104.0917
2JE72	AFTER DEGAUSSING AND ADJUSTMENT										
7JE72	A03	SAL	X	25			(-0.04)	10	18		
9JE72	A03	SPO	X	25	- 92	0.03	-0.02				104.0935
14JE72	IMU-25 SHIPPED FROM DELCO/MKE TO NR.										
29JE72	NSC	G&N	X	25 222	- 90	-0.03					
3AU72	NSC	G&N	X	25	- 165	0.00					
18SE72	IMU-25 REMOVED FROM CM-118 AT NR.										
20OC72	IMU-25 INSTALLED IN CM-119 AT NR.										
27OC72	NSC	G&N	X	25 213	- 76	-0.04					
21NO72	NSC	G&N	X	25 213	- 110	0.01					
15DE72	REMOVED FROM CM-119 AT NR.										
19DE72	SHIPPED FROM NR TO DELCO.										
6MY73	SB5	SPO	X	25	- 232	0.04	0.07			0.04	104.0867
7MY73	SB5	SAL	X	25			(0.03)	11	21		
28AU73	SB6	SPO	X	25	- 301	-0.03	-0.02			0.04	104.0871
28AU73	SB6	SAL	X	25			(0.01)	8	23		
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE										
24SE73	IMU-25 INSTALLED IN CM-119,G&N-213,SL-RESCUE VEHICLE										
07DE73	K9B	G&N	X	25 213	- 246	0.11					
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO										
24JE74	SB6	SPO	X	25	- 363	0.03	*0.02*			*0.03*	*104.0900*
28JE74	SB6	SAL	X	25			(0.06)	10	22		
23OC74	SB6	SPO	X	25	- 331	0.07	*0.11*			*0.05*	*104.0884*
4NO74	SB6	SAL	X	25			(0.12)	7	24		
18NO74	IMU 25 SHIPPED FROM DELCO TO KSC										
26NO74	IMU 25 INSTALLED IN CM-111										
05DE74	K0B	G&N	X	25 215	- 235	0.04					
22JA75	K0B	G&N	X	25 215	- 240	0.03					
05MY75	K9A	G&N	X	25 215	- 287	0.03					

G&N 215, CM 111, IMU 25, APOLLO PIPA 2AP11OR, X AXIS



1-G BIAS DRIFT PLOTTED BY TIME



SCALE FACTOR DRIFT PLOTTED BY TIME

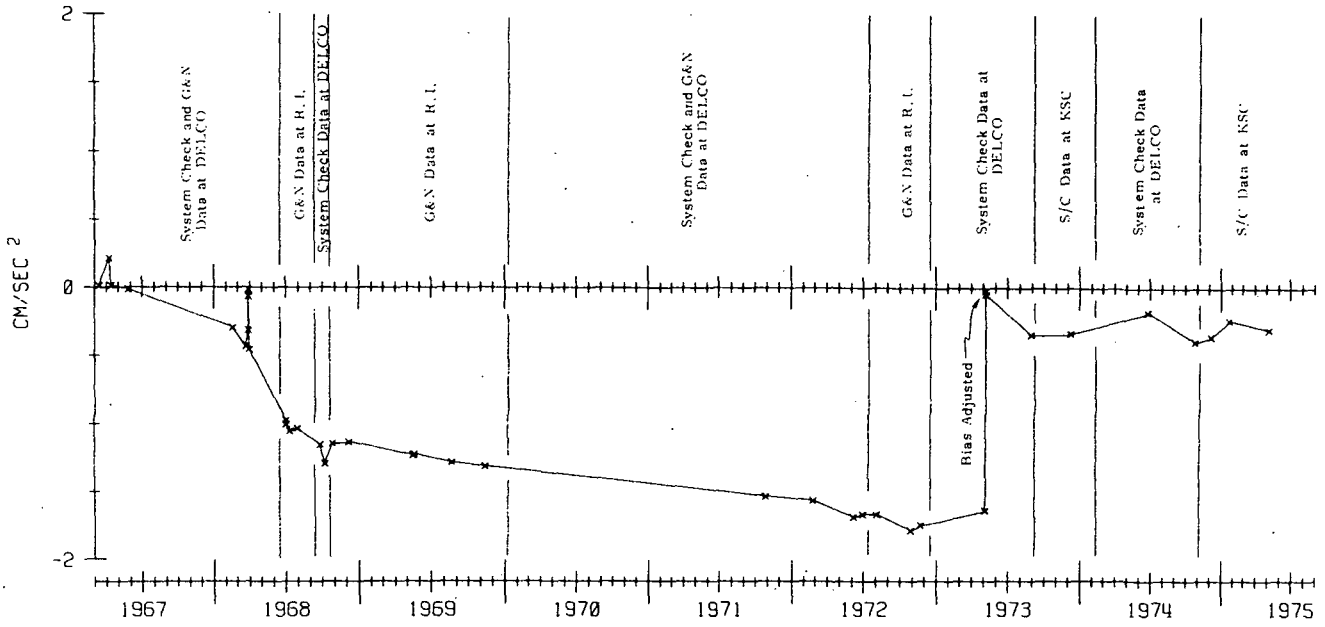
DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SF	TG BIAS	NULL BIAS	ROT-AL-WOB ANGLE		TRANS.	TORQ MON CURRENT
20SE66	S42	ACC			- 32		0.00				105.1093
12MR67	A48	FST			20	0.01	0.00	8	4		
13MR67	ENTERED IMU 25 IN G&N 211 Y										
7AP67	A03	SPR	Y	25	- 376	0.21	0.16				105.1161
11AP67	A03	SPR	Y	25	8	0.01	-0.03				105.1159
25MY67	A03	SPO	Y	25	- 37	-0.02	-0.03				105.1325
29MY67	A03	SAL	Y	25			(0.03)	- 22			
31MY67	A03	SAL	Y	25					- 13		
16PR68	IMU S/N 25 ASSIGNED TO G&N 212										
16PR68	A03	SPR	Y	25	- 348	-0.30	-0.30				105.1370
21MR68	A01	SPO	Y	25	- 373	-0.44	-0.46				105.1347
21MR68	A01	SAL	Y	25			(-0.48)	9	- 15		
27MR68	A01	G&N	Y	25 212	- 662	-0.32					105.1200
27MR68	A01	G&N	Y	25 212	- 388	-0.02					105.1205
27MR68	A01	G&N	Y	25 212	- 429	-0.07					105.1194
30MR68	A01	G&N	Y	25 212	- 345	-0.46					105.1207
	IMU S/N 25 SHIPPED TO NR										
1JL68	N06	G&N	Y	25 212	- 429	-0.98					
1JL68	N06	G&N	Y	25 212	- 434	-1.01					
1JL68	N06	G&N	Y	25 212	- 446	-1.01					
11JL68	N06	G&N	Y	25 212	- 441	-1.06					
30JL68	N06	G&N	Y	25 212	- 548	-1.04					
23SE68	IMU S/N 25 RETURNED TO AC MKE										
25SE68	A03	SCK	Y	25	- 481	-1.16	-1.20				105.1378
40C68	A03	SAL	Y	25			(-1.20)	- 8	- 8		
70C68	A03	SPO	Y	25	- 555	-1.30	-1.28				105.1316
110C68	IMU S/N 25 SHIPPED TO NR										
250C68	N06	G&N	Y	25 215	- 489	-1.15					
250C68	N06	GAL	Y	25 215				19	- 3		
6DR68	N02	G&N	Y	25 215	- 666	-1.14					
16MY69	NSC	G&N	Y	25 215	- 792	-1.24					
19MY69	NSC	G&N	Y	25 215	- 797	-1.23					
20AU69	NSC	G&N	Y	25 215	- 824	-1.29					
13NO69	NSC	G&N	Y	25 215	- 882	-1.32					
9JA70	IMU S/N 25 SHIPPED FROM NR TO AC/MKE										
28OC71	A01	SPO	Y	25	-1053	-1.54	-1.53			0.04	105.1247
1NO71	A01	SAL	Y	25			(-1.56)	6	- 17		
25FE72	A01	G&N	Y	25 222	-1155	-1.57					
5JE72	A03	SPO	Y	25	-1106	-1.69	-1.69			0.05	105.1246
5JE72	RAN EO 3700-NULL RESOLUTION										
7JE72	A03	SAL	Y	25			(-1.71)	1	- 18		
14JE72	IMU-25 SHIPPED FROM DELCO/MKE TO NR.										
29JE72	NSC	G&N	Y	25 222	-1150	-1.67					
3AU72	NSC	G&N	Y	25	-1191	-1.67					
18SE72	IMU-25 REMOVED FROM CM-118 AT NR.										
20OC72	IMU-25 INSTALLED IN CM-119 AT NR.										
27OC72	NSC	G&N	Y	25 213	-1225	-1.79					
21NO72	NSC	G&N	Y	25 213	-1276	-1.75					
15DE72	REMOVED FROM CM-119 AT NR.										

2AP-276 CONTINUED

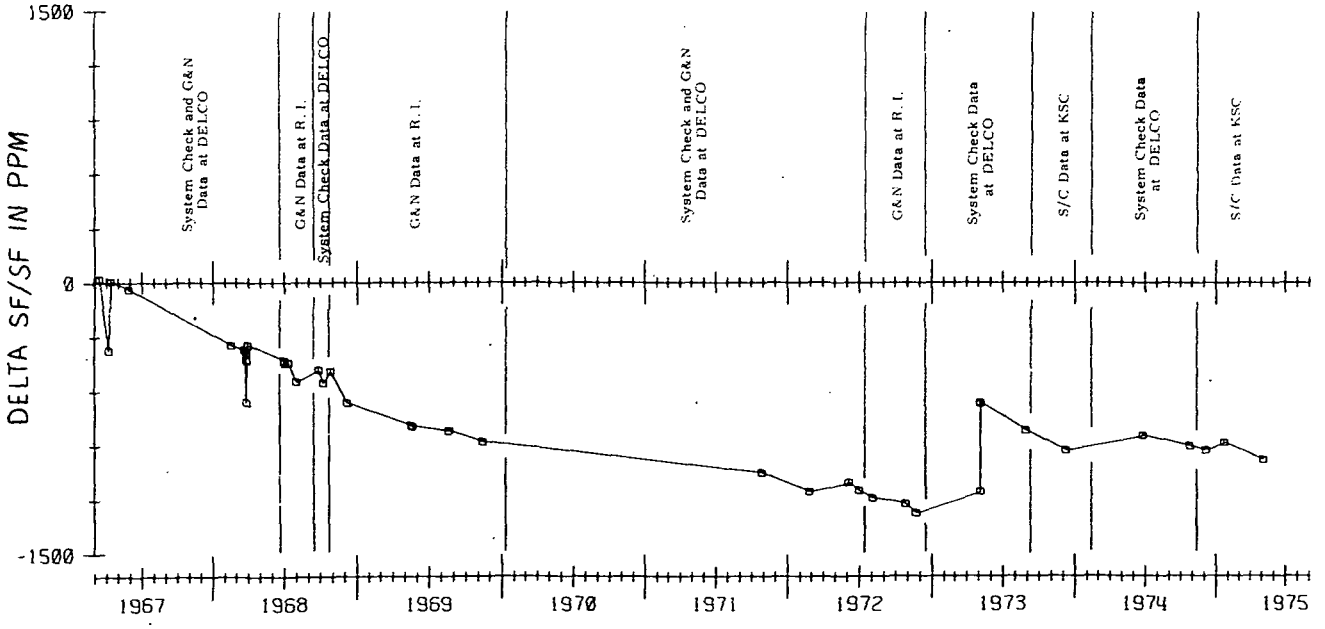
DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SF	IG BIAS	NULL BIAS	ROT-AL-WOB ANGLE		TRANS.	TORQ MON CURRENT
19DE72	SHIPPED FROM NR TO DELCO.										
5MY73	SB5	SPO	Y	25	-1158	-1.64	-1.64				
5MY73		AFTER ADJUSTMENT									
5MY73	SB5	SPO	Y	25	- 670	-0.02	-0.05			0.04	105.1430
6MY73	SB5	SPO	Y	25	- 665	-0.05	-0.03				105.1452
8MY73	SB5	SAL	Y	25			(-0.09)	6	- 12		
28AU73	SB6	SPO	Y	25	- 820	-0.35	-0.32				105.1453
29AU73	SB6	SAL	Y	25			(-0.32)	10	- 12	0.04	
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE										
24SE73	IMU-25 INSTALLED IN CM-119,G&N-213,SL-RESCUE VEHICLE										
07DE73	K9B	G&N	Y	25	213 - 929	-0.34					
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO										
25JE74	SB6	SPO	Y	25	- 848	-0.18	-0.15			0.04	105.1556
28JE74	SB6	SAL	Y	25			(-0.26)	11	- 12		
25OC74	SB6	SPO	Y	25	- 904	-0.40	-0.38			0.05	105.1479
5NO74	SB6	SAL	Y	25			(-0.41)	7	- 14		
18NO74	IMU 25 SHIPPED FROM DELCO TO KSC										
26NO74	IMU 25 INSTALLED IN CM-111										
5DE74	KOB	G&N	Y	25	215 - 929	-0.36					
22JA75	KOB	G&N	Y	25	215 - 888	-0.24					
05MY75	K9A	G&N	Y	25	215 - 983	-0.31					

2AP-276 COMPLETED

G&N 215, CM 111, IMU 25, APOLLO PIPA 2AP276, Y AXIS



1-G BIAS DRIFT PLOTTED BY TIME



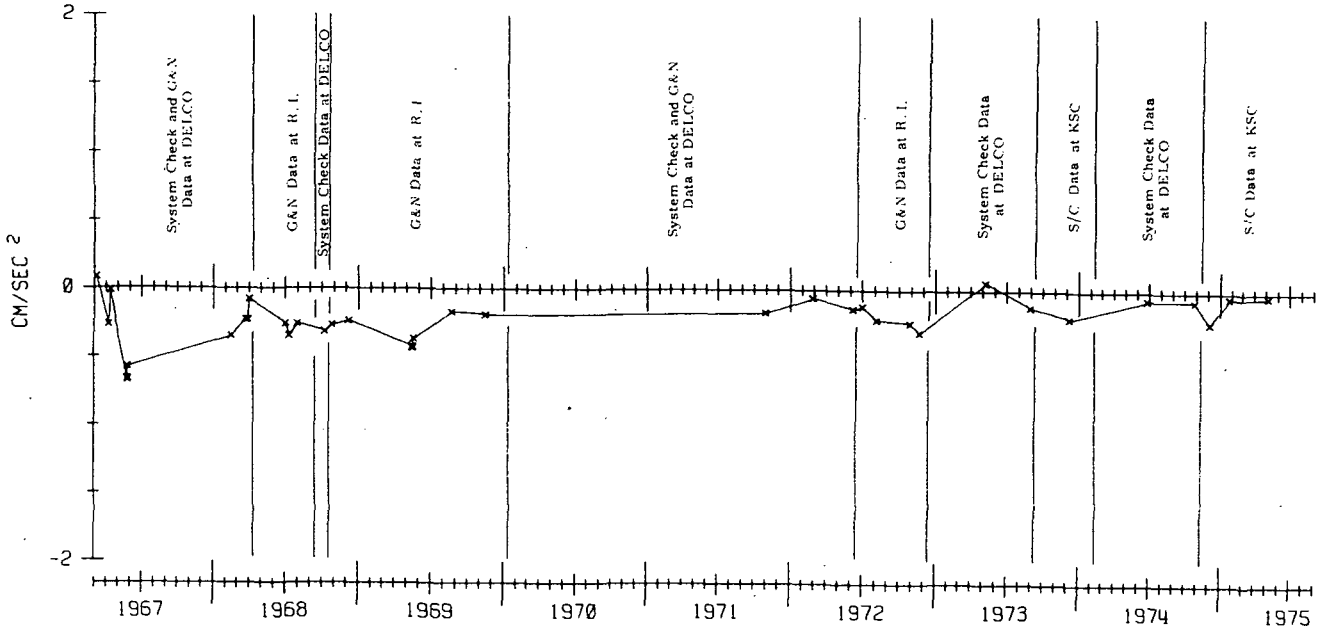
SCALE FACTOR DRIFT PLOTTED BY TIME

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SP	TG BIAS	NULL BIAS	ROT-AL-WOB ANGLE	TRANS.	TORQ MON CURRENT
11OC66	S41	ACC			- 96		0.00			103.6342
6MR67	A44	T&A						- 4 - 2		103.6824
6MR67	A44	T&A						- 8 - 3		103.6824
7MR67	A44	PST			41	0.08	0.00	- 9 6		103.6770
	2AP-282 ASSN TO IMU S/N 25 , Z									
7AP67	A03	SPR	Z	25	- 39	-0.27	-0.21			103.6815
11AP67	A03	SPR	Z	25	- 9	-0.02	0.06			103.6796
25MY67	A03	SPO	Z	25	- 253	-0.68	-0.59			103.6655
25MY67	A03	SPO	Z	25	- 290	-0.67	-0.59			103.6661
25MY67	A03	SPO	Z	25	- 299	-0.58	-0.45			103.6636
26MY67	A03	SAL	Z	25			(-0.56)	- 4		
16FE68	IMU S/N 25 ASSIGNED TO G&N 212									
16FE68	A03	SPR	Z	25	- 441	-0.35	-0.28			103.6658
21MR68	A01	SPO	Z	25	- 404	-0.23	-0.22			103.6672
21MR68	A01	SAL	Z	25			(-0.25)	0		
27MR68	A01	G&N	Z	25 212	- 417	-0.23				103.6540
27MR68	A01	G&N	Z	25 212						103.6545
27MR68	A01	G&N	Z	25 212						103.6537
30MR68	A01	G&N	Z	25 212	- 317	-0.08				103.6541
	IMU S/N 25 SHIPPED TO NR									
1JL68	N06	G&N	Z	25 212	- 370	-0.26				
11JL68	N06	G&N	Z	25 212	- 397	-0.35				
30JL68	N06	G&N	Z	25 212	- 431	-0.26				
23SE68	IMU S/N 25 RETURNED TO AC MKE									
40C68	A03	SAL	Z	25			(-0.26)	- 6		
7OC68	A03	SPO	Z	25	- 451	-0.32	-0.30			103.6700
11OC68	IMU S/N 25 SHIPPED TO NR									
25OC68	N06	G&N	Z	25 215	- 422	-0.27				
25OC68	N06	GAL	Z	25 215				10 - 18		
6DE68	N02	G&N	Z	25 215	- 453	-0.24				
16MY69	NSC	G&N	Z	25 215	- 419	-0.43				
16MY69	NSC	G&N	Z	25 215	- 413	-0.44				
16MY69	NSC	G&N	Z	25 215	- 422	-0.44				
19MY69	NSC	G&N	Z	25 215	- 465	-0.37				
20AU69	NSC	G&N	Z	25 215	- 471	-0.17				
13NO69	NSC	G&N	Z	25 215	- 526	-0.19				
9JA70	IMU S/N 25 SHIPPED FROM NR TO AC/MKE									
28OC71	A01	SPO	Z	25	- 551	-0.17	-0.14		0.05	103.6619
1NO71	A01	SAL	Z	25			(-0.14)	2		
25FE72	A01	G&N	Z	25 222	- 538	-0.06				
5JE72	A03	SPO	Z	25	- 562	-0.14	-0.11		0.03	103.6608
5JE72	RAN EO 3700-NULL RESOLUTION									
7JE72	A03	SAL	Z				(-0.17)	- 2		
14JE72	IMU-25 SHIPPED FROM DELCO/MKE TO NR.									
29JE72	NSC	G&N	Z	25 222	- 470	-0.12				
3AU72	NSC	G&N	Z	25 222	- 512	-0.22				
18SE72	IMU-25 REMOVED FROM CM-118 AT NR.									
20OC72	IMU-25 INSTALLED IN CM-119 AT NR.									
27OC72	NSC	G&N	Z	25 213	- 463	-0.24				
21NO72	NSC	G&N	Z	25 213	- 486	-0.31				

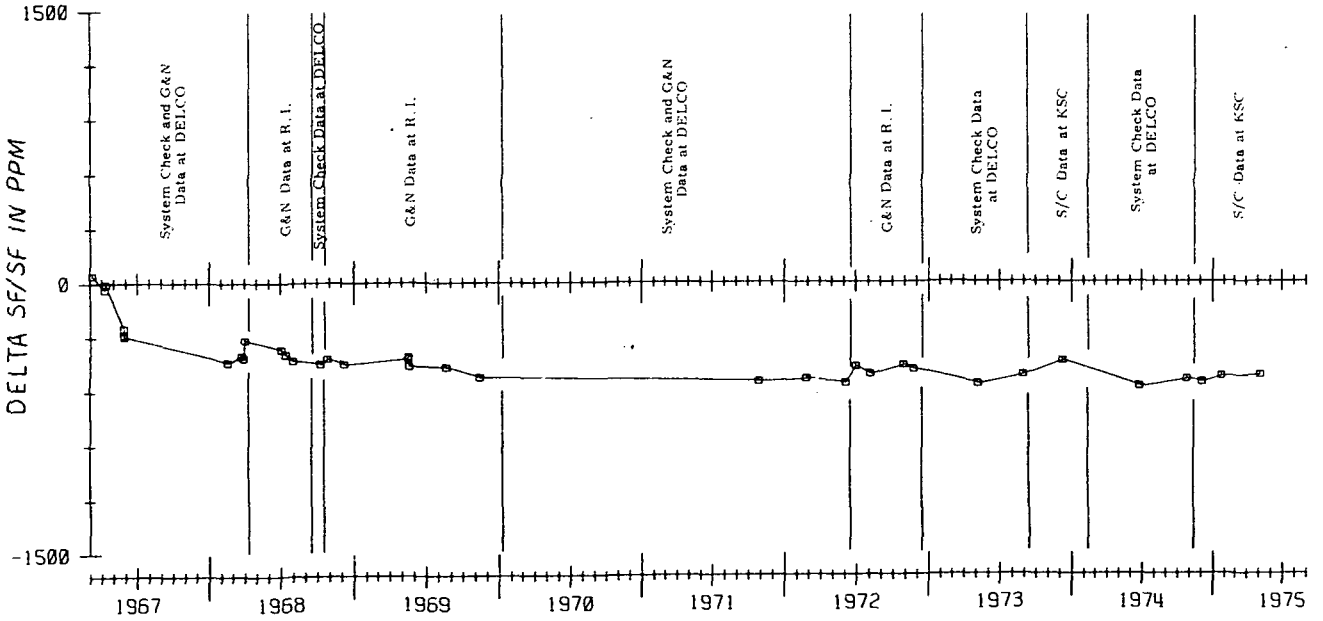
2AP-282 CONTINUED

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SP	IG BIAS	NULL BIAS	ROT-AL-WOB ANGLE		TRANS.	TORQ MON CURRENT
15DE72	REMOVED FROM CM-119 AT NR.										
19DE72	SHIPPED FROM NR TO DELCO.										
7MY73	SB5	SPO	Z 25		- 569	0.06	0.10			0.05	103.6582
8MY73	SB5	SAL	Z 25				(0.07)	15			
28AU73	SB6	SPO	Z 25		- 519	-0.12	-0.11				103.6627
29AU73	SB6	SAL	Z 25				(-0.15)	5		0.04	
12SE73	IMU-25 MOVED FROM DELCO TO KSC, SL-RESCUE VEHICLE										
24SE73	IMU-25 INSTALLED IN CM-119,G&N-213,SL-RESCUE VEHICLE										
07DE73	K9B	G&N	Z 25	213	- 440	-0.20					
13FE74	IMU 25 SHIPPED FROM KSC TO DELCO										
25JE74	SB6	SPO	Z 25		- 583	-0.06	-0.01			0.04	103.6650
28JE74	SB6	SAL	Z 25				(-0.08)	-	2		
25OC74	SB6	SPO	Z 25		- 541	-0.07	-0.05			0.04	103.6633
4NO74	SB6	SAL	Z 25				(-0.02)	3			
18NO74	IMU 25 SHIPPED FROM DELCO TO KSC										
26NO74	IMU 25 INSTALLED IN CM-111										
5DE74	KOB	G&N	Z 25	215	- 559	-0.23					
22JA75	KOB	G&N	Z 25	215	- 526	-0.04					
05MY75	KOB	G&N	Z 25	215	- 520	-0.03					

G&N 215, CM 111, IMU 25, APOLLO PIPA 2AP282, Z AXIS



1-G BIAS DRIFT PLOTTED BY TIME



SCALE FACTOR DRIFT PLOTTED BY TIME

STANDARD DEVIATION (1σ) OF THE IRIG AND PIPA
PARAMETER UNCERTAINTIES USED FOR
MISSION PERFORMANCE SUMMARY
CM 111, IMU 25

PARAMETER IMU Axis	X	Y	Z
PIPAs			
Data Compilation Period 12/05/74 - 5/05/75			
Accelerometer Bias (cm/sec^2)	0.01	0.06	0.11
Scale Factor (SF/SF ppm)	29	48	21
IRIGs			
Data Compilation Period 12/05/74 - 5/05/75			
Bias Drift (MERU)	0.5	0.9	0.4
ADSRA (MERU/g)	1.9	0.2	0.7
ADIA (MERU/g)	2.8	2.5	1.4
ADOA (MERU/g)	0.1	0.4	0.2

Data is based upon performance in the IMU. Point-to-point stability in operation is much better than the above data.

PROPOSED GYRO AND ACCELEROMETER
PERFORMANCE COMPENSATIONS

PARAMETER IMU Axis	X	Y	Z
PIPAs			
Accelerometer Bias (cm/sec^2)	+0.03	-0.31	-0.03
Scale Factor (SF/SF ppm)	-290	-980	-520
IRIGs			
Bias Drift (MERU)	+0.7*	+1.6	+3.0
ADSRA (MERU/g)	+3	-5	-1
ADIA (MERU/g)	+22	-13	-5

*Compensation selected as NBD -ADOA

Dictionary of Terms

ACC	Acceptance Test Data
ACD	After Cooldown
ACE	A. C. Electronics (presently Delco Electronics)
ADJ	Adjusted
ADOA	Acceleration Sensitive Drift Due to Acceleration along the OA
BCSW	Binary Current Switch
BIA	Bias Adjusted
BUSS	High, Low, or Nominal Direct Current Test
CDN	Post Cooldown
CQL	Component Qualification
CRQ	Component Requalification
CRR	Retest after Minor Adjustment or Resistor Changes
CRT	Retest Data
CSS	Short Servo Test
CVR	Component Verification
DGI	Degaussed IRIG
DGS	Degaussed
F/F	Float Freedom
FST	Final Stability
GAL	Guidance & Navigation PIPA Alignment
G&N	Guidance & Navigation System Measurement
GP	Gaussed PIPAs
HBS	Hi Bus Voltage
I&A	Inspection and Acceptance
ISS	Inertial Subsystem Data
KSC	Kennedy Space Center
LBS	Lo Bus Voltage
MW	Milliwatt
NAR	North American Rockwell (presently Rockwell International, Inc.)
NBS	Nominal Bus Voltage
OOS	Out of Spec
RDT	Wheel Rundown Time, Seconds
RI	Rockwell International

APPENDIX

ELECTRICAL POWER REQUIREMENTS

This section was extracted from the MIT/IL Report E-1142 (Rev. 59) "SYSTEM STATUS REPORT". It is included in this report for convenience.

Electrical power and energy reporting is based upon the inflight spacecraft sequence of events for the Design Reference Mission as developed by the Apollo Mission Planning Task Force (AMPTF). (Reference GAEC Report Volume III - LED-540-12, dated October 30, 1964).

The accompanying diagrams present the power drawn through the spacecraft circuit breakers. It is assumed that power is drawn from the spacecraft's primary +28VDC supply and a 400 cps-115 VAC single-phase inverter.

Intermittent power peaks can exist, particularly during operation of displays and controls at random times. The energy content in these peaks is considered negligible.

All values (except those mentioned above) are actual expected levels of power at 28.0 VDC. They are based on measured values on G&N systems 207 and 208 for the Block II Command Module. No margin factor has been applied to protect against possible differences between G&N systems and spacecrafts. Thus, these values should not be taken as "not to exceed" extremes.

The following Interface Control Documents serve as the guidelines for reporting power figures.

CM Block II MH01-01327-216 "G&N Electrical Input Power" signed 15 July 1965.

BLOCK II GUIDANCE & NAVIGATION LOAD ON PRIMARY +28 VDC COMMAND MODULE

BASED UPON 198.5 HOURS (8.27 DAY) LUNAR ORBIT MISSION
DESIGN REFERENCE MISSION

STATUS OCTOBER 1967

REFERENCE GAEC REPORT - LED 540-12, 30 OCTOBER 1964
APOLLO MISSION PLANNING TASK FORCE

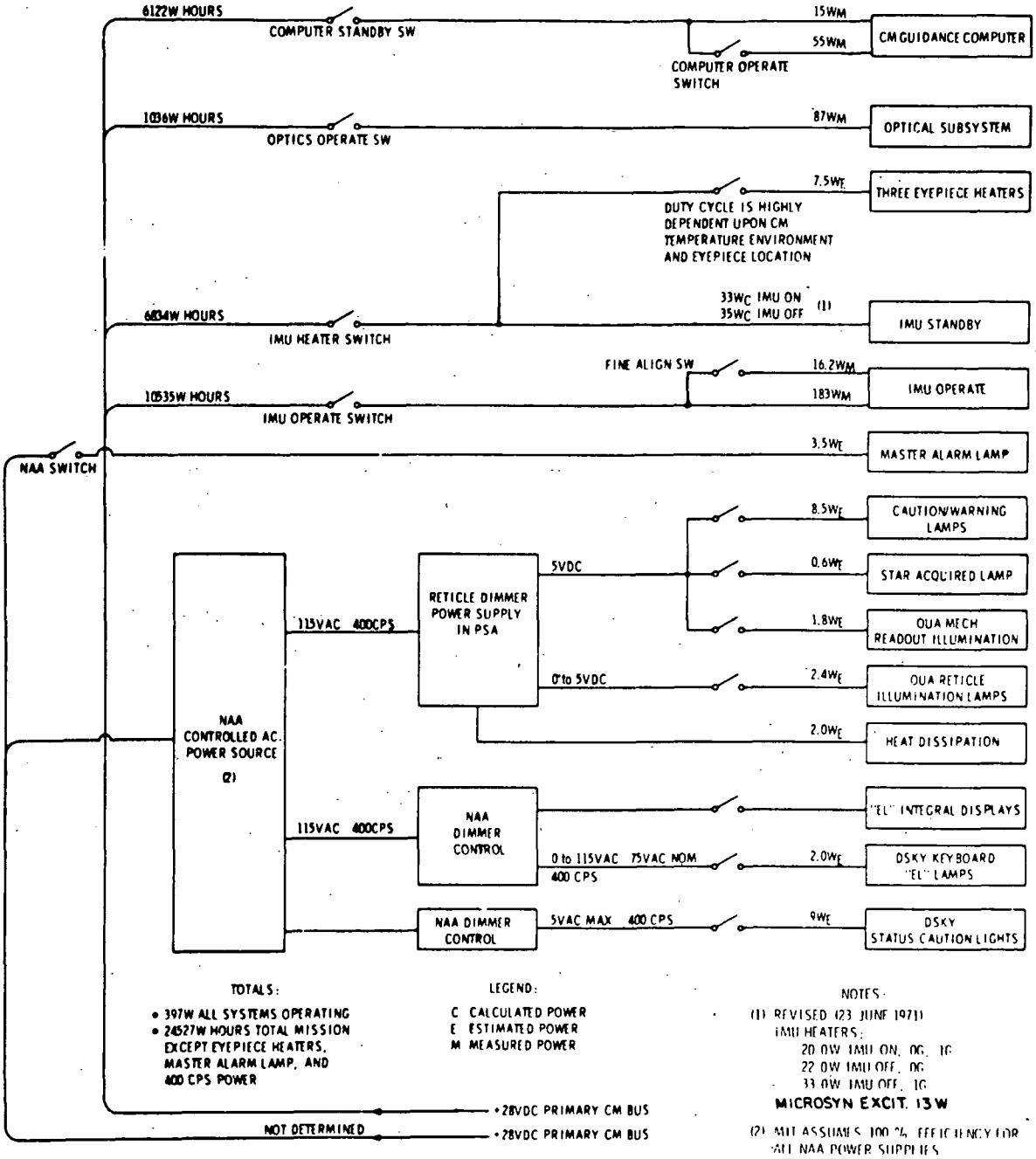


Figure A-1

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